

Generic WWW/HTML interfaces for Genome Databases

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The Human Genome Center at Lawrence Livermore National Laboratory has accomplished our physical mapping task for chromosome 19 and are now poised to map and sequence other areas of human and non-human genomes. Since our current database is human chromosome 19 specific, a new database schema was required to accomplish these goals (details presented in the informatics workshop). This database contains over 150 tables, requiring a large number of new interfaces to be built to do data entry and non-graphical querying. We built a small set of generic tools to provide WWW/HTML interfaces to avoid the large up-front cost of writing custom interfaces as well as the much larger cost of maintaining them over time as user needs and the database evolve. This was done by exploiting a set of some 20+ "meta tables" which were used to completely describe the target database tables. Other tools, not described here, were written to generate all SQL to build the database, to generate backup scripts and documentation, and to automate data conversion.

The *HTML_display* tool, given as input the database, table, and primary key id of a row in that table, will generate an HTML output of that object, including hot-links to all parent and child objects, for any table described in the "meta tables". This single 260-line Perl program provides a first-order textual object browser which is impervious to changes in the database. The *HTML_aduq* tool will generate an HTML form suitable for Add, Delete, Update, and Query functions on any {database, table} described in the "meta tables". It uses data in those tables to intelligently generate selection or checkoff lists when appropriate, and it knows how to examine the state mechanism used by *HTML_exp* to handle foreign keys in multi-table transactions. *HTML_exp* provides a generic way to describe such "experiment" transactions, such that an item selected in one step can be automatically referenced in a subsequent step. It also provides hooks for custom programs or arbitrary external URL access. Finally, the *HTML_menu* tool provides customized experiment input transaction menus based on usernames, as a first level of access control.

In summary, about 2,000 lines of generic Perl code give us first-order generation and processing of all HTML interface Add, Delete, Update, Query, and Display needs for any tables in our database. Changes to target database tables only require meta table changes, not interface coding changes.

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